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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/966,741	10/01/2001	Kazuichiroh Itonaga	0819-0658	3606

22204 7590 09/24/2003

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EXAMINER

QUACH, TUAN N

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 09/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/966,741

Applicant(s)

ITONAGA, KAZUICHIROH

Examiner

Tuan Quach

Art Unit

2814

-- Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 4-6, 10-18, 20 and 25-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 7-9, 19, 21-24, 34-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

For convenience, "et al." is omitted.

Claims 1-3, 7, 8, 21-23, 34, 35, 37-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamal.

Kamal teaches forming gate 106, spacers 108/110, metal 112, first heat treatment to form silicide 122, removing unreacted metal, implanting nitrogen to the silicide, second treatment to form silicide. See Figs. 1-7, column 4 lines 10 to column 5 line 66. It would have been obvious to one skilled in the art and would have been inherent that the first silicide would be polycrystalline as it corresponds to similar metal deposition and first heating for silicidation, and the implant would render the silicide amorphous, absent evidence to the contrary, and given that similar processing is employed. The provision of source/drain regions correspond to well known component regions for MOS device and as such would have been obvious. Regarding the first silicide being metal rich now claimed in claims 1 and 19, to the extent such metal rich language can be determined, such would be inherent or otherwise given that the silicide obtained in Kamal contains CoSi thus is metal rich as compared to CoSi₂ and that the same processing of first thermal annealing is effected for silicidation in Kamal, column 4 lines 41-44. Regarding the change from the introduction of nitrogen into the first silicide

before, in, or after any of the forming a metal film, performing first thermal annealing, removing unreacted metal film, to the introduction of nitrogen into the first silicide after forming the metal film and before removing the unreacted metal, such remains obvious over the teaching in Kamal, as delineated above, and at column 5 lines 35-460 wherein the introduction of nitrogen into the cobalt silicide would reduce agglomeration; the selection of the appropriate sequential processing out of a few possible alternatives would have been obvious; the order of the introduction of nitrogen does not matter since as evidenced by applicant's own disclosure and original claim the introduction can be effected in any order and the interchangeability thereof thus is self-evident. Regarding the cobalt silicide that is rich in cobalt contains a compound of Co_2Si and CoSi , to the extent the composition of the respective components can be determined, such would have been inherent and obvious as the same processing is employed, namely the first thermal annealing, and that Co_2Si is not precluded from the first cobalt silicide; alternatively, it would have been obvious to one skilled in the art that such first silicide would comprise such silicides that are not cobalt disilicide during the first thermal annealing. Regarding the desired depth of the amorphous state in claims 39 and 40, such selection and optimization of of implant parameters and depth is a matter of routine experimentation and optimization well within the purview of one skilled in the art and as such would have been obvious. Regarding the bamboo structure in claim 41, such would be inherent and obvious, absent evidence to the contrary, given that the Office is not equipped to determine the structure as the same processing is employed to form the silicide in question and that the silicide in question does not preclude any

bamboo structure. Alternatively, it would have been obvious to one skilled in the art to have employed to have employed conventional bamboo structure if desired.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamal as applied to claims 1-3, 7, 8, 21-23, 34, 35, 37-41 above, and further in view of Iwamatsu.

Regarding claim 9, silicon ions correspond to well known alternative of nitrogen ions as evidenced by Iwamatsu, column 6 lines 63-65, and thus the interchange therebetween would have been obvious.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamal as applied to claims 1-3, 7, 8, 21-23, 34, 35, 37-41 above, and further in view of Delfino and Koyanagi.

Although Kamal does not recite the preclean and nitrogen plasma, such use would have been conventional and advantageous as evidenced by Delfino, the abstract, wherein plasma treatment would serve to provide a clean surface for silicidation, and as evidenced by Koyanagi, column 11 lines 15-17, where nitrogen plasma corresponds to a well known alternative to ion implantation.

Claims 19, 36, ^{are} ~~is~~ rejected under 35 U.S.C. 103(a) as being unpatentable over Kamal taken with Frankel.

Kamal is applied as above regarding claims 1-3, 7, 8, 21-23, 34, 35, 37-41 and does not explicitly recite the second treatment of less than 725°C.

Frankel teaches temperature for second annealing including temperature at 700°C. See column 6 lines 42-44.

It would have been obvious and would have been within the purview of one skilled in the art to have selected a temperature below 725 °C, since such corresponds to conventional temperature as evidenced by Frankel and since such temperature selection and optimization is well within the purview of one skilled in the art.

Applicant's arguments filed July 9, 2003 have been fully considered but they are not persuasive.

Applicant argues that Kamal does not teach forming silicide layer rich in metal. Nonetheless, this is taught at column 4 line 40-45.

Applicant further argues that Kamal discloses implanting nitrogen after removing the unreacted metal. Nonetheless, regarding the change from the introduction of nitrogen into the first silicide before, in, or after any of the forming a metal film, performing first thermal annealing, removing unreacted metal film, to the introduction of nitrogen into the first silicide after forming the metal film and before removing the unreacted metal, such remains obvious over the teaching in Kamal, as delineated above, and at column 5 lines 35-460 wherein the introduction of nitrogen into the cobalt silicide would reduce agglomeration; the selection of the appropriate sequential processing out of a few possible alternatives would have been obvious; the order of the introduction of nitrogen does not matter since as evidenced by applicant's own disclosure and original claim the introduction can be effected in any order and the interchangeability thereof thus is self-evident.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is 703-308-1096. The examiner can normally be reached on M - F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Wael Fahmy can be reached on (703) 308-4918. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318 (Before Final) and (703) 872-9319 (After Final).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Tuan Quach
Primary Examiner